

Methods Supporting Usability Evaluation of the Collaborative Meeting Place

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Introduction

Ubiquitous computing presents many challenges for user interface evaluation. The physical collection and organization of usability data is a difficult task. There are many means of input and output and often times users are mobile. In comparison, for a typical single-user usability evaluation setting with a desktop computer, one could take a multifaceted approach to data collection. A scan converter could be used to capture user interaction on the computer's screen. Evaluators might log critical incidents and note task activity data. A video camera would record the user's actions and comments.

In a collaborative setting where multiple users are using multiple devices, the challenges to collect useful usability data become increasingly confounded. Multiple computers and users provide many additional streams of evaluation data. With these many sources of data, it becomes difficult to recreate and document the sequence of events. At this level, automated logging by the application of user interactions and activities becomes an increasingly desired feature to simplify the collection and organization of usability data.

The challenges for ubiquitous computing quickly become obvious. These devices are often simple by nature, limiting the amount of storage available for saving or bandwidth for uploading information collected about user interactions. Furthermore limited processing power may limit logging activities that may take place on the device without compromising performance for the user. Mobile devices may have limited states of connectivity, which could provide additional challenges for synchronizing logged data on multiple devices. Perhaps another distinction is that videotaping, which once played primary role in collecting data about the user's interactions with a software application, could now most easily be shifted to collecting context information and public interactions between users.

Project Description

It is such a progression of evaluation data collection challenges that we have faced with the usability methods we have had to use with our own collaborative software, the LiNC virtual school and MOOsburg. The LiNC (Learning in Networked Communities) virtual school is an environment that integrates collaborative tools supporting group activities for students in our local public schools [1]. MOOsburg is a network community MOO designed to closely parallel the town of Blacksburg, VA [2]. Evaluation for these applications have utilized multiple methods including observation, video recording of the users' activities and screen capture, server-side automated data logging of collaborative events in the system, recording of critical incidents, and other data [3]. Logged events were filtered and organized through custom tools to show user actions, and that modified log data was combined with the rest of the collected data to provide a highly accurate view of use [4].

In a related effort to those projects, we plan to use the underlying collaborative infrastructure from this software to develop a same place collaborative meeting room. This meeting room will provide a large, interactive public display as well as wireless handheld devices for personal input and output in the collaborative setting. One possible scenario is a design meeting where participants use personal handheld devices instead of paper and pen:

While discussing one aspect of the user interface design, Bob and Sue both sketch their ideas for the GUI. As the discussion progresses, Sue presents her design idea to the group on the large display. Bob counters by displaying his ideas. After some debate, Bob adds some of his features to Sue's design and the team reaches a consensus.

Methods

To support the collection of usability data for our project, we will at a minimum need to collect from three sources of data. First, high-level interactions of users on the handheld devices would need to be logged. Second, collaborative interactions will be logged on the server supporting the collaboration. Third, videotape recording of the group context along with physical and audio interactions. Furthermore tools and efforts will need to support the integration of the collected data.

Since we are highly interested in interaction techniques for the user with the handheld device, we will need to log user interactions on the device. Because of limited storage space as well as processing power, logging will need to be done at the application (rather than event) level. Ideally, logging would be at a high enough level to minimize the quantity of data while still capturing the user's meaning and intent. Additionally, filters may need to be added so that the evaluator can control what data is logged for different segments of the evaluation period to further minimize any impact on bandwidth and processing power.

Server-side logging of collaborative activities by the users will essentially continue in the way they work for our current collaborative applications. We will need to enhance our existing tools to merge interaction data logged separately on the handheld devices with the collaboration information on the server. One exciting aspect of integrating data collected from the individual handheld devices is that the data represents individual bits of personal, asynchronous work. The merged data can then be filtered to provide a more complete view of individual or group interactions. One possibility is being able to analyze "point of view" interactions where multiple users were separately working on the same or similar sets of information in different ways asynchronously before their ideas were brought synchronously to the rest of the group. This is something that clearly separates this type of activity and varying levels of connectivity from a purely synchronous collaborative environment.

Following individual users with video camera(s) trying to capture their interactions with ubiquitous devices would be awkward for both the users and the evaluators. For the meeting room setting, use of video cameras will be wider angle to support capture of physical interactions between the users, as well as their movements, and context for their activities. Video recording will also capture work at the large screen interactive display.

Conclusion

This article has presented some of the issues related with evaluating ubiquitous computing systems. In particular, it describes the challenges apparent in evaluating the collaborative use of wireless handheld devices along with a public display. We offered three sources of evaluation data to collect in a same place meeting room setting. These techniques will be tried in the next stage of our work and evaluated for their utility.

References

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